



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11) **EP 1 052 123 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:

15.11.2000 Bulletin 2000/46

(51) Int. Cl.⁷: **B60G 11/113**, B60G 11/46,
F16F 1/368

(21) Application number: **00303866.8**

(22) Date of filing: **09.05.2000**

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: **10.05.1999 GB 9910705**

(71) Applicant:

**Meritor Heavy Vehicle Systems Limited
Llay, Wrexham, Clwyd LL12 0PB (GB)**

(72) Inventor: **Smith, Gary Lee**

Summerhill, Wrexham (GB)

(74) Representative:

**Stonehouse, Sidney William
Barker Brettell**

**138 Hagley Road
Edgbaston**

Birmingham B16 9PW (GB)

(54) **Axle mounting assembly and suspension arm assembly including said assembly**

(57) An axle mounting assembly, e.g. for mounting an axle on a longitudinal member such as a leaf spring (2) in a trailer suspension, comprises a spring seat (12) and a clamp plate (14) which secure to the longitudinal member and each have location surfaces (41, 44), such as recesses and/or ribs or lugs, which engage the longitudinal member and locate the spring seat and clamp plate laterally on the member. Shearing loads transmitted in use by an axle through the spring seat (12) are reacted therefore by the longitudinal member (2). The spring seat (12) and/or clamp plate (14) may be located longitudinally on the longitudinal member by means of dowels (13, 15) engaged in recesses (11) in the components. Friction modifiers (16, 17) e.g. of polyurethane 499, may be inserted between the longitudinal member and the spring seat and the clamp plate to reduce fretting of the member in use.

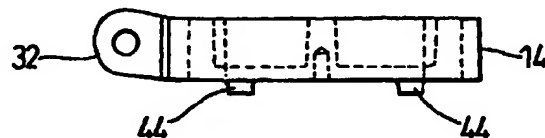


Fig. 8

Description

[0001] This invention relates to an axle mounting assembly for or included in a suspension arm assembly in which a longitudinal member, for example a leaf spring, is adapted to carry an axle or stub axle for a vehicle.

[0002] A mounting for an axle on a leaf spring, for example in a suspension for an articulated trailer, conventionally comprises a clamp plate and a spring seat which are clamped together by means of U-bolts, one above and one below the leaf spring intermediate its ends and substantially in vertical alignment with one another. Thin laminar inserts, known as friction modifiers, are interposed between the clamp plate and the leaf spring and between the spring seat and the leaf spring to reduce fretting of the leaf spring. Such fretting can lead to early fatigue failure of the leaf spring.

[0003] This design was developed for use with mechanical suspensions and was carried over to air suspensions which, over a period of some years, have largely superseded the mechanical suspensions.

[0004] Air suspensions have been developed to cater for higher loadings than obtained for mechanical suspensions, on which the interfaces/friction modifiers were subjected to lateral and/or longitudinal loading. With air suspensions the loadings are not only higher but skewing loads are experienced as well as lateral and longitudinal loads.

[0005] The purpose of this invention is to overcome limitations of the existing design.

[0006] According to a first aspect, the present invention consists in an axle mounting assembly for a suspension arm assembly comprising a spring seat, a clamp plate and means to secure the spring seat and the clamp plate on a longitudinal member, characterised in that the spring seat and clamp plate each have location surfaces which in use engage the longitudinal member and locate the respective spring seat and clamp plate laterally with respect to the longitudinal member, whereby skewing loads transmitted in use by an axle through the spring seat are reacted by the longitudinal member.

[0007] The location surfaces may comprise upstanding ribs or lugs on, or by recesses in, the spring seat and/or the clamp plate between or within which the longitudinal member can be received.

[0008] The axle mounting assembly may include the longitudinal member to which the spring seat and the clamp plate are secured.

[0009] The longitudinal member may be a leaf spring.

[0010] The longitudinal member may have, intermediate its ends, a recess in each of upper and lower surfaces thereof. The spring seat and the clamp plate may each also have a corresponding recess, and a dowel or like locating member may be engaged in the corresponding recesses of the longitudinal member and the

spring seat and the clamp plate whereby the spring seat and the clamp plate are located longitudinally with respect to the longitudinal member.

[0011] The recesses in the longitudinal member may be in vertical alignment, or non-aligned vertically, and are preferably on a longitudinal centreline of the member.

[0012] The recesses may comprise through holes, in which event a single dowel may be used for relative location of the longitudinal member, spring seat and clamp plate.

[0013] Friction modifiers, perforated to accommodate the dowel or dowels, as described with reference to Figure 1, may be fitted between the longitudinal member and the spring seat and clamp plate components.

[0014] The friction modifiers preferably comprise shear compliant membranes, made for example of polyurethane 499, such as HYPERLAST 2874/502 of Polyurethane Products Ltd. The material is chosen such that its hardness is of a value that, in use, will not damage the surface of the longitudinal member, nor will the material extrude under load.

[0015] According to a second aspect, the present invention consists in a suspension arm assembly characterised in that it has an axle mounting assembly in accordance with the foregoing first aspect of the invention.

[0016] According to a third aspect, the present invention consists in an air suspension assembly characterised in that it comprises a suspension arm assembly in accordance with the foregoing second aspect of the invention which includes a longitudinal member, a hanger bracket to which the longitudinal member is connected for pivotal movement and an air spring carried by the longitudinal member.

[0017] An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is an exploded view of an air suspension assembly embodying the present invention,

Figure 2 is a plan view from above of a spring seat, Figure 3 is a side view and Figure 4 is a plan view from below of the spring seat of Figure 1,

Figure 5 is a longitudinal section through the spring seat,

Figure 6 is an end view of the spring seat,

Figure 7 is a section on line A-A of Figure 4,

Figure 8 is a side elevation of a clamp plate,

Figure 9 is a plan view from above of the clamp plate of Figure 8, and

Figure 10 is a section on line B-B of Figure 9.

[0018] Referring to Figure 1, the air suspension assembly includes a suspension arm assembly and comprises a hanger bracket 1, a leaf spring 2 having an eye 3 at one end and a platform 4 at the other end. The eye 3, containing a bearing bush 5, is inserted between

opposed sides of the bracket 1 which has through holes adjacent its lower end for a bolt 5A which passes through the bush to secure the leaf spring 2 for pivotal movement.

[0019] The platform 4 has through holes for bolts 6 to secure a piston 7 for an air spring 8. The air spring is adapted to be secured to a vehicle by way of an adapter plate 9.

[0020] The leaf spring 2 has vertically aligned recesses 11 in its upper and lower surfaces. An axle mounting member in the form of a spring seat 12 has a corresponding recess in its upper face whereby it is located, on assembly, relative to the leaf spring 2 by a dowel 13 engaged in the respective recesses.

[0021] Similarly, a clamp plate in the form of a top plate 14 has a corresponding recess in its lower surface whereby it is located, on assembly, relative to the leaf spring 2 by a dowel 15 engaged in the respective recesses.

[0022] Thin, shear compliant, laminar inserts 16, 17 are interposed as friction modifiers between the leaf spring 2 and the spring seat 12 and between the leaf spring 2 and the top plate 14 to reduce fretting of the leaf spring in use. The inserts have holes 18, 19 through which the dowels 13, 15 can pass.

[0023] A cylindrical axle beam or a stub axle (not shown) may be engaged with the spring seat 12 and the assembly may be completed by two U bolts 21, 22 which engage the underside of the axle beam or stub axle and pass upwardly through holes at the corners of the spring seat 12 and the top plate 14 to be secured with washers 23 and nuts 24.

[0024] The hanger bracket 1 has opposed spaced lugs 25 between which a bushed eye 26 at an upper end of a telescopic shock absorber 27 is received for pivotal securing by a bolt 28, washer 29 and nut 31.

[0025] The top plate 14 also has opposed spaced lugs 32. A bushed eye 34 at a lower end of shock absorber 27 is entered between the lugs 32 to be pivotally secured by a bolt 35, washer 36 and nut 37.

[0026] Referring now to Figures 2 to 7 of the drawings, a recess 41 is formed in and runs the length of the upper surface 42 of the spring seat 12. The recess 41, as seen in Figures 2, 5 and 7 is parallel-sided and widened over its centre section 43. The leaf spring 2 is received into the recess 41 whereby it is enabled, in use, to react skewing loads imparted by an axle beam or stub axle carried by the spring seat 12.

[0027] Referring now to Figures 8 to 10 of the drawings, the top plate 14 has four depending ribs 44 at its underside between which the leaf spring 2 is received whereby the top plate is prevented from skewing, in use, relative to the leaf spring.

[0028] As has been described with reference to Figure 1, the U bolts 21, 22 secure the spring seat 12, the leaf spring 2 and the top plate 14 together, together with the laminar inserts 16, 17, and skewing loads in use are transmitted from the axle beam or stub axle to the leaf

spring through the spring seat and top plate assembly whereby the leaf spring reacts these loads.

[0029] The invention has been described with reference to a cylindrical axle beam but is, of course, equally applicable to an axle beam which is of non-circular section, for example of square section.

Claims

1. An axle mounting assembly for a suspension arm assembly comprising a spring seat (12), a clamp plate (14) and means (21,22,23,24) to secure the spring seat and the clamp plate on a longitudinal member, characterised in that the spring seat and clamp plate each have location surfaces (41,44) which in use engage a longitudinal member and locate the respective spring seat and clamp plate laterally with respect to the longitudinal member, whereby skewing loads transmitted in use by an axle through the spring seat are reacted by the longitudinal member.
2. An axle mounting assembly as claimed in claim 1 characterised in that the location surfaces comprise upstanding ribs, lugs or like protrusions (44) on at least one of the spring seat (12) and clamp plate (14).
3. An axle mounting assembly as claimed in claim 1 characterised in that the location surfaces comprise a recess (41) in at least one of the spring seat (12) and clamp plate (14).
4. An axle mounting assembly as claimed in any preceding claim characterised in that it includes a longitudinal member (2) to which the spring seat (12) and the clamp plate (14) are secured.
5. An axle mounting assembly as claimed in claim 4 characterised in that the longitudinal member (2) has, intermediate its ends, a recess (11) in each of upper and lower surfaces thereof, and the spring seat (12) and the clamp plate (14) each have a corresponding recess in a face thereof which, on assembly, lies adjacent the respective upper and lower surfaces of the longitudinal member, and dowels or like locating members (13,15) are engaged between the corresponding recesses whereby the spring seat and clamp plate are located longitudinally with respect to the longitudinal member.
6. An axle mounting assembly as claimed in claim 5 characterised in that the recesses in the longitudinal member (2) are substantially in vertical alignment.
7. An axle mounting assembly as claimed in claim 6,

characterised in that the recesses comprise a through hole in the longitudinal member (2), whereby a single dowel or like member (13,15) locates the spring seat (12) and clamp plate (14) relative to the longitudinal member.

5

8. An axle mounting assembly as claimed in any of claims 4 to 7 characterised in that the recesses (11) in the longitudinal member (2) are situated on a longitudinal centreline of the member. 10
9. An axle mounting assembly as claimed in any of claims 4 to 8 characterised in that a friction modifier (16) is engaged between the spring seat (12) and the longitudinal member (2). 15
10. An axle mounting assembly as claimed in any of claims 4 to 9 characterised in that a friction modifier (17) is engaged between the clamp plate (14) and the longitudinal member (2). 20
11. An axle mounting assembly as claimed in claim 9 or claim 10 characterised in that the friction modifier (16,17) is made of polyurethane 499. 25
12. An axle mounting assembly as claimed in any of claims 4 to 11 characterised in that the longitudinal member (2) is a leaf spring.
13. A suspension arm assembly characterised in that it has an axle mounting assembly as claimed in any preceding claim. 30
14. An air suspension assembly comprising a suspension arm assembly having an axle mounting assembly, a hanger bracket (1) to which a longitudinal member (2) is connected for pivotal movement and an air spring (8) carried by the longitudinal member, characterised in that the axle mounting assembly is as claimed in any of claims 4 to 12. 35 40

45

50

55

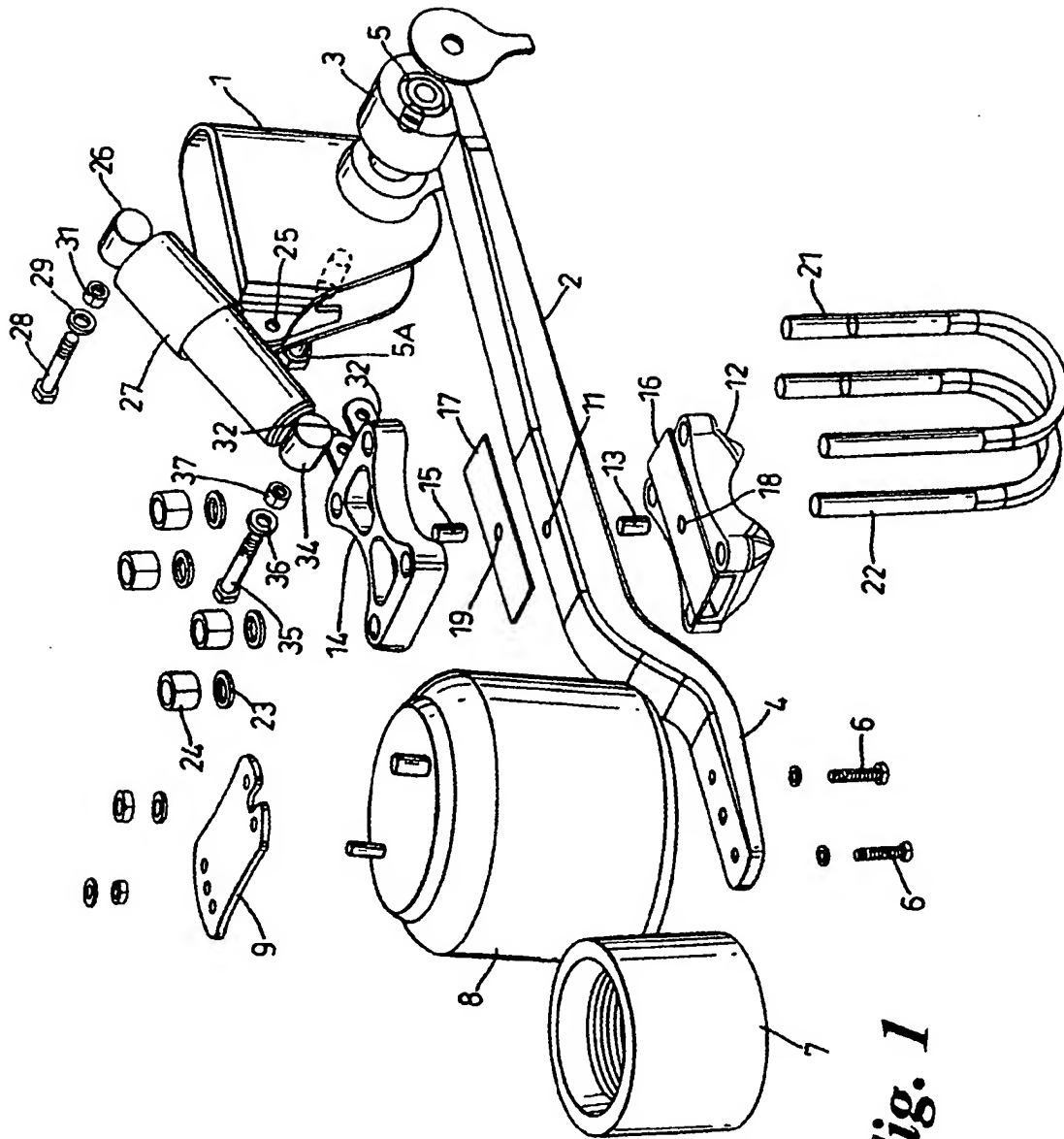


Fig. 1

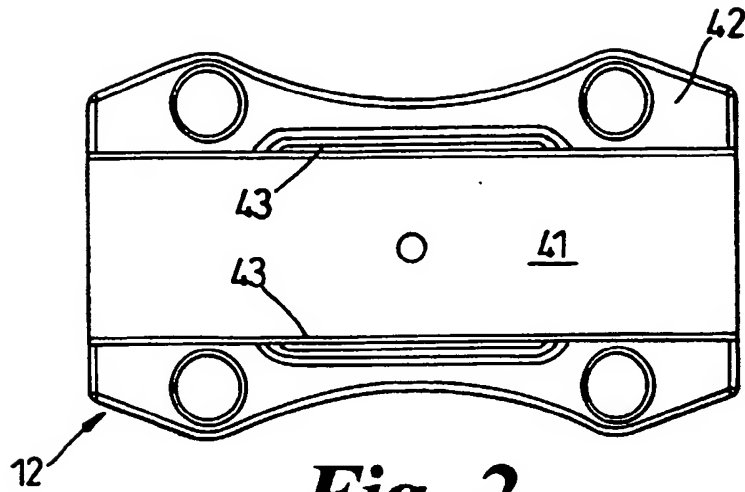


Fig. 2

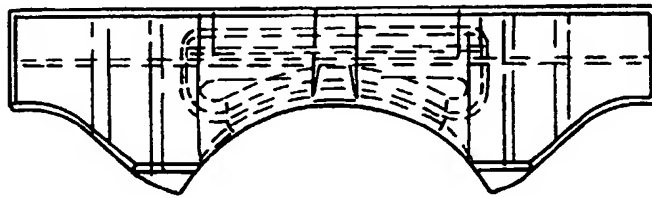


Fig. 3

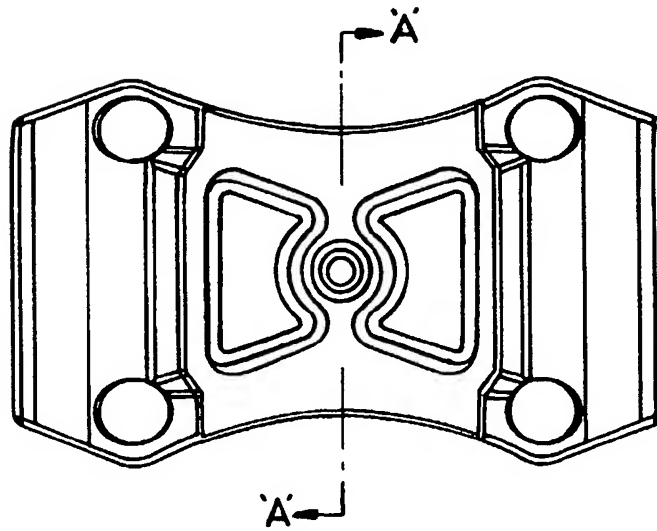


Fig. 4

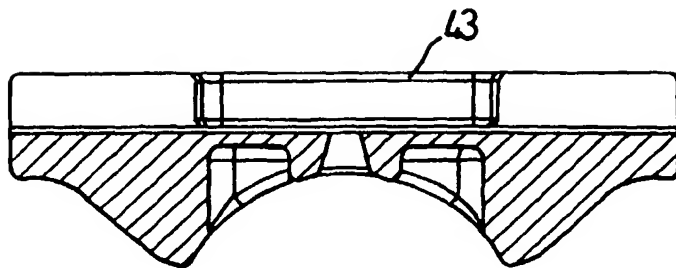


Fig. 5

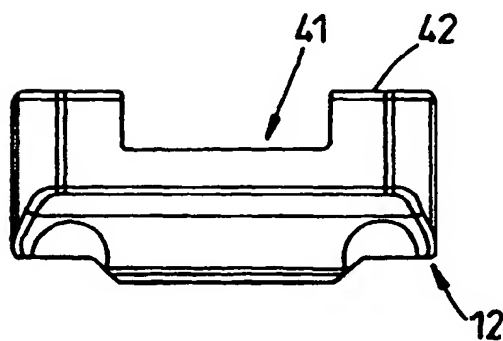


Fig. 6

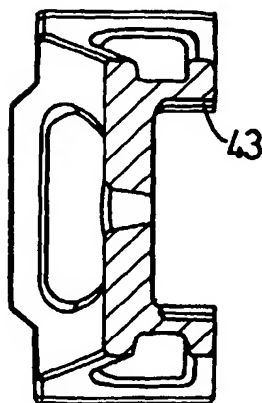


Fig. 7

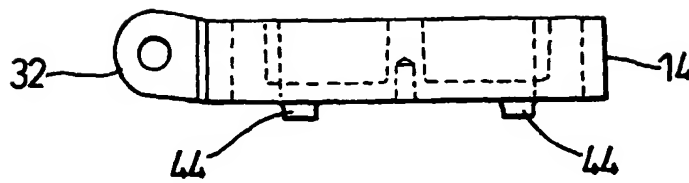


Fig. 8

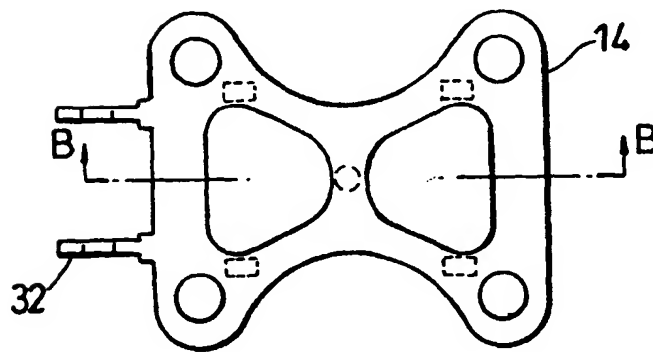


Fig. 9

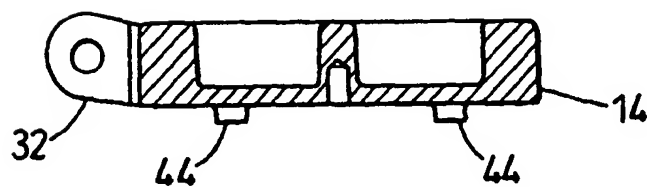


Fig. 10



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 3866

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 240 676 A (HOESCH ISOCAR FASERVERSTARKTE) 14 October 1987 (1987-10-14) * the whole document *	1,3,4,9, 10,12,13	B60G11/113 B60G11/46 F16F1/368
X	US 3 630 541 A (CARLSON CHARLES A ET AL) 28 December 1971 (1971-12-28) * the whole document *	1,3,4,9, 10,13,14 11	
X	US 2 643 111 A (BURTON, R.B.) 23 June 1953 (1953-06-23) * the whole document *	1,3,4, 12,13 5,6,8-11	
Y			
Y	US 4 508 325 A (MARSH BARRY J) 2 April 1985 (1985-04-02) * the whole document *	5,6,8-11 1	
A			
X	US 1 377 430 A (PETTY, W.M.) 10 May 1921 (1921-05-10) * the whole document *	1,3-8,13	
X	US 1 539 070 A (BROWN, R.H.) 26 May 1925 (1925-05-26) * the whole document *	1,3-8,13	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B60G F16F
A	US 3 061 301 A (BAJER, J. ; ET AL) 30 October 1962 (1962-10-30) * figures *	1,3-11, 13	
A	US 1 899 913 A (MCCUEN, C.L.) 28 February 1933 (1933-02-28) * page - *	1,3-11, 13	
A	US 4 519 591 A (BUSH JOHN W ET AL) 28 May 1985 (1985-05-28) * figures 1,2,5 *	1,3-12	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 August 2000	Examiner Tsitsilonis, L
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (PwCo1)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 3866

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 643 406 A (MOUNIER-POULAT FRANCOIS ET AL) 17 February 1987 (1987-02-17) * abstract; figures * -----	1,3,4, 9-12	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 August 2000	Examiner Tsitsilonis, L
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P4C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 3866

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-08-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0240676 A	14-10-1987	AT 390655 B	11-06-1990
		AT 42386 A	15-11-1989
US 3630541 A	28-12-1971	NONE	
US 2643111 A	23-06-1953	DE 808025 C	
		GB 661632 A	
US 4508325 A	02-04-1985	AT 23610 T	15-11-1986
		AU 561347 B	07-05-1987
		AU 1304283 A	27-10-1983
		BR 8301957 A	20-12-1983
		CA 1201135 A	25-02-1986
		DE 3367659 D	02-01-1987
		DK 174083 A	22-10-1983
		EP 0092399 A	26-10-1983
		GB 2119725 A,B	23-11-1983
		IN 159259 A	18-04-1987
		JP 58225237 A	27-12-1983
		ZA 8302330 A	28-12-1983
US 1377430 A	10-05-1921	NONE	
US 1539070 A	26-05-1925	NONE	
US 3061301 A	30-10-1962	DE 1838603 U	
		GB 908481 A	
US 1899913 A	28-02-1933	NONE	
US 4519591 A	28-05-1985	AU 556997 B	27-11-1986
		AU 1734583 A	23-02-1984
		BR 8304419 A	27-03-1984
		CA 1220799 A	21-04-1987
		DE 3330054 A	23-02-1984
		FR 2532023 A	24-02-1984
		GB 2125514 A,B	07-03-1984
		IT 1170441 B	03-06-1987
		JP 59050239 A	23-03-1984
		MX 162512 A	15-05-1991
		SE 8304377 A	21-02-1984
US 4643406 A	17-02-1987	FR 2562169 A	04-10-1985
		DE 3563251 D	14-07-1988
		EP 0161155 A	13-11-1985

EPO FORM P459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

THIS PAGE BLANK (USPTO)